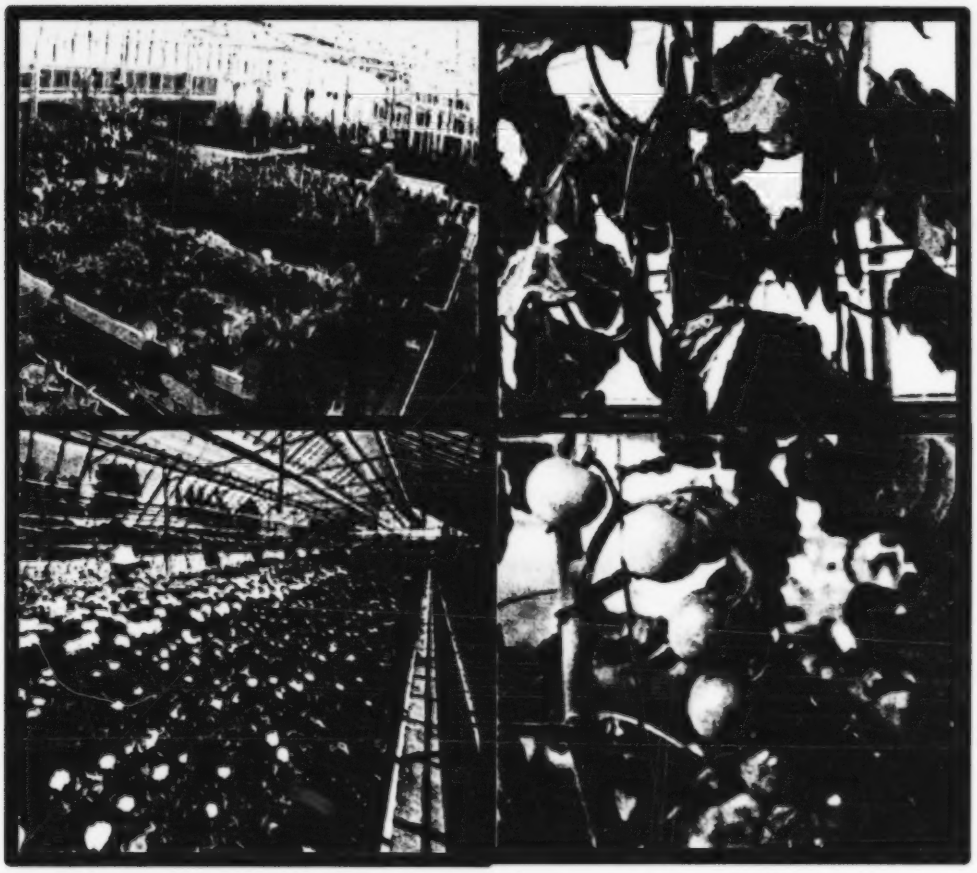
The Economics of Production and Marketing of Greenhouse Crops in Alberta



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AGRICULTURE, FOOD AND RURAL DEVELOPMENT

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The Economics of Production and Marketing of Greenhouse Crops in Alberta

By

G. Nabi Chaudhary

Economics Unit
Economics and Competitiveness Division
Alberta Agriculture, Food and Rural Development

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G. Nabi Chaudhary

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SECTION I

Introduction

The greenhouse industry in Alberta has gone through several adjustments, therefore, the need was felt to develop costs and returns based on current conditions so the industry can change accordingly. Because of changing economic conditions, previously compiled information on the greenhouse industry in the late eighties had become more or less obsolete. The cost of natural gas, electricity and other greenhouse supplies became major concerns during the fall of 2000 and early 2001. This study based on actual costs and returns from forty greenhouse operators across the province, provides more current data on costs and returns for major greenhouse crops.

Significant increases in the price of electricity and greenhouse supplies created some serious economic difficulties for greenhouse operators in the province. Realizing these difficulties, the provincial government announced energy assistance programs for the greenhouse industry as well.[1]

Major greenhouse crops grown include vegetables, bedding plants, potted flowers and ornamentals, cut flowers, herbs, perennials and tree seedlings. More recently, particularly over the last decade a number of the greenhouse operations have switched to producing tree seedlings under contract for the forestry industry. During the last decade, greenhouse industry in Alberta has grown rapidly. This growth was prompted by consumer demand for fresh and quality produce. Alberta advantage in terms of lower taxed and input costs also contributed to this growth. However, recent rapid escalation of natural gas and electricity prices have dampened further expansion prospects for this industry.

The size of Alberta's greenhouse industry, under both glass and plastic, was about six million square feet (138 acres) in 1990. In 2000, the area under cover in Alberta has increased to over 11.8 million square feet (270 acres), an increase of almost 90 percent during the last decade. Alberta greenhouse industry is ranked fourth in the country when compared to the other provinces. Ontario continues to lead the greenhouse industry with 66 million square feet (1,515 acres) area, followed by British Columbia at 33 million square feet (758 acres) and Quebec at 26 million square feet (597 acres).

Approximately 99 percent of the greenhouse area in Alberta is under commercial production, with the balance confined to institutions such as universities, research stations and colleges. Most of the Alberta's greenhouse operations are highly diversified and are equipped with most modern equipment to achieve production efficiencies. The gross revenue generated by the greenhouse industry in 2000 was estimated at about $98 million, with an investment or total value of assets of about $225 million.

[1] Alberta government announced a one-time gas rebate of $0.40 per square foot during 2000 and 2001.

This report provides the most current information on greenhouse production costs and returns for the major greenhouse crops (bedding plants/ornamentals, cucumbers, peppers, tomatoes and tree seedlings).

Objectives of the Study

The major objectives of the study were:

1) Determination of the structure of the greenhouse industry in Alberta.
2) Estimation of greenhouse production costs and returns by major crops.
3) Identification of the main factors influencing production and marketing of greenhouse crops in Alberta.
4) Identification of major problems experienced by greenhouse producers in Alberta.

The Study Sample

A questionnaire specifically designed for greenhouse operations was used to obtain the required information from a selected sample of greenhouse operators across the province. Forty greenhouse operators were interviewed to obtain production costs and returns information on bedding plants/ornamentals, cucumbers, peppers, tomatoes and tree seedlings for the 2000-2001 crop year.

Method of Analysis

After completion of the questionnaire, raw data were reviewed to make sure that no information was missing before entering it for analytical purposes. In the past, we used a mainframe computer program "SPSS" (Statistical Package for the Social Sciences) to analyze both the individual farm reports as well as computing group averages. However, for the 2000-2001 crop year, a Paradox 9 program (micro-computer database) was used to analyze the greenhouse data. This program is very versatile and allows changes and updates in many of the cost allocations.

Each greenhouse operation was analyzed separately. The study sample was divided by crop groups. In order to preserve confidentiality of the data obtained, no group averages were developed for greenhouse crops with less than four participants.

SECTION II

Greenhouse Operations in Alberta

Although greenhouses in Alberta are scattered throughout the province, more than two-thirds of these operations are located in the south and south-central regions. The area around Medicine Hat is called "the greenhouse belt" of Alberta because of the Red Hat Co-op (a producer organization responsible for marketing cucumbers) and the large number of greenhouses in this area. Most greenhouse operations are located in cities and towns because of easy access to labour, marketing facilities, utilities and the services necessary for a greenhouse operation. Because of very high land prices and taxes, during the last several years a few new greenhouses have been built at a distance from major population centers. Distribution of greenhouses in Alberta is shown in Figure 1.

Survey of the Greenhouse Industry

According to a survey[2] of the greenhouse industry completed in 2001, there were approximately 386 commercial greenhouse operations in Alberta with a total area of 11,797,951 square feet (1 096 464 square metres) or 271 acres (110 hectares). Since 1986, the greenhouse industry in Alberta has increased by 95 percent.

This comprehensive survey, undertaken by the Alberta Agriculture, Food and Rural Development Department in cooperation with Alberta Greenhouse Growers Association (AGGA) provided detailed information on the size and structure of the greenhouse industry in the province. Agriculture and Food Council and AGGA provided funding for this project. It reported on the types of crops grown in greenhouses, heating systems, types of greenhouse material, marketing of greenhouse produce, (wholesale and retail operations) and greenhouse operators' concerns, etc.

The three regions with the largest greenhouse area in the province are Medicine Hat (32 percent), Red Deer (16 percent) and Edmonton (15 percent). The remaining 29 percent of greenhouse area is scattered throughout the province, from Peace River in the north to Lethbridge in the south. Table 1 provides information on the size of the greenhouse industry in the province. Table 2 classifies greenhouse operations by area (size of greenhouse operation).

Table 3 lists the number of greenhouse operations surveyed in each city/town in 2000. The province was divided into these areas to obtain a better understanding of the location and size of greenhouse operations.

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[2] Abdusalam Asif Maan, "Profile of the Greenhouse Industry in Alberta", Alberta Agriculture, Food & Rural Development, Edmonton, Alberta, April 2001.

Figure 1. **Location of Greenhouses in Alberta**

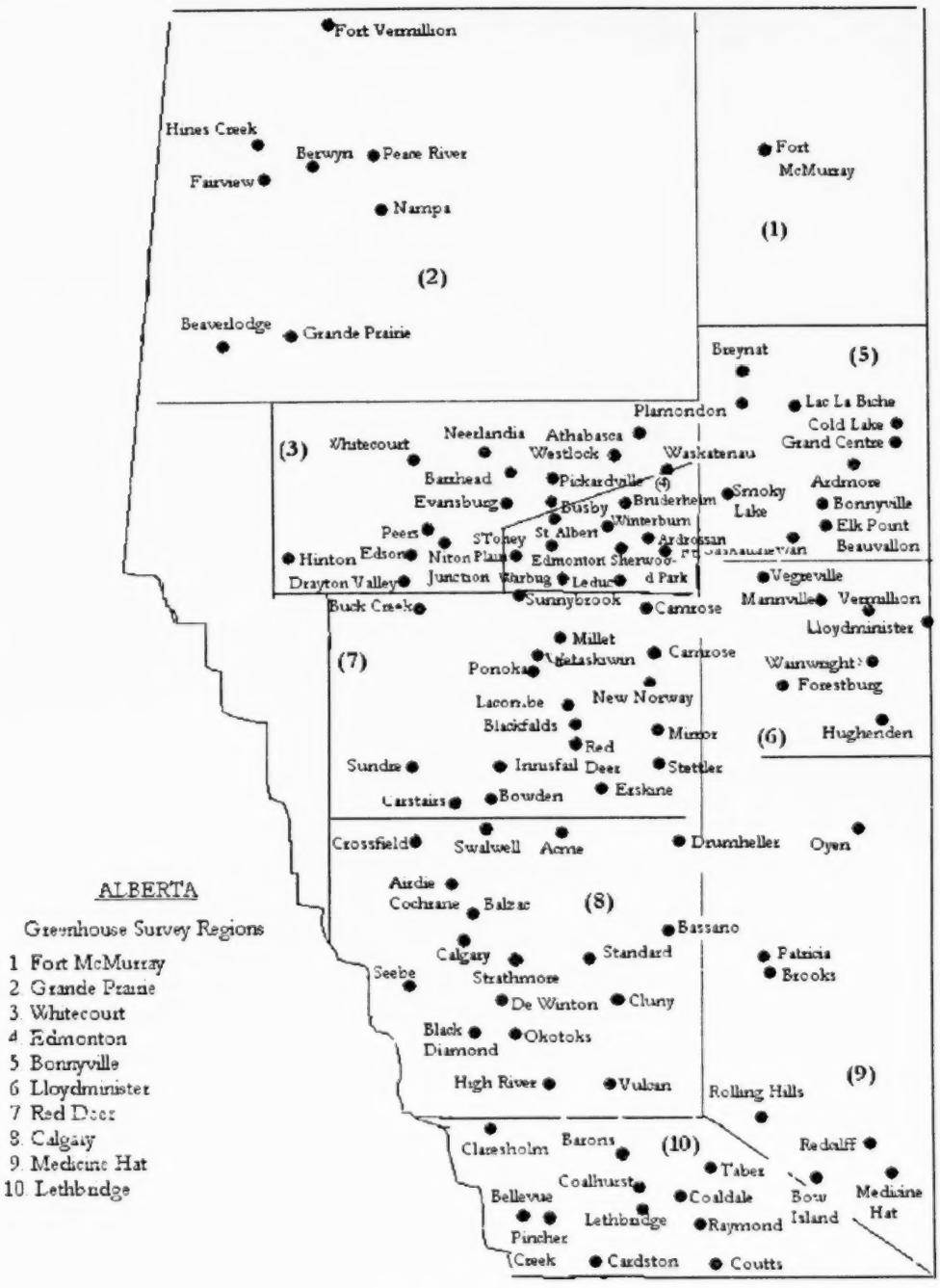


TABLE 1

DISTRIBUTION OF GREENHOUSE AREA BY MAJOR CENTERS, 2000			
Region	**Area in Square Meters**	**Area in Square Feet**	**Percent of Total**
Fort McMurray	2 872	30,900	
Grande Prairie	87 392	940,334	8
Whitecourt	25 555	274,972	2
Edmonton	160 085	1,722,512	15
Bonnyville	85 228	953,058	8
Lloydminster	25 979	279,530	2
Red Deer	177 590	1,910,868	17
Calgary	144 686	1,556,816	13
Medicine Hat	351 139	3,778,252	32
Lethbridge	32 594	350,709	3
TOTAL	**1 096 464**	**11,797,951**	**100**

TABLE 2

DISTRIBUTION OF GREENHOUSE AREA BY SIZE OF OPERATION		
Size of Operation (Sq Ft)	**Number Surveyed**	**Percent of Total**
Less than 10,000	162	42
10,000 to 19,999	77	20
20,000 to 40,000	76	20
More than 40,000	71	18
TOTAL	**386**	**100**

TABLE 3

Size of Greenhouse Operations in Alberta, 2000					
Region	**Greenhouse Area (sq.ft)**				**Total Number of Greenhouses by Region**
	< 10,000	**10,000 to 19,999**	**20,000 to 40,000**	**>40,000**	
1. Fort McMurray	3	2	0	0	5
2. Grande Prairie	23	3	1	4	31
3. Whitecourt	26	8	4	0	38
4. Edmonton	25	19	20	8	72
5. Bonnyville	7	5	2	3	17
6. Lloydminster	18	5	3	1	27
7. Red Deer	27	16	9	10	62
8. Calgary	15	12	12	6	45
9. Medicine Hat	4	2	19	38	63
10. Lethbridge	14	5	6	1	26
TOTAL	**162**	**77**	**76**	**71**	**386**
Percent of Total Number of Operations	**42**	**20**	**20**	**18**	**100**

According to the survey done by the Alberta Tree Nursery and Horticulture Centre, 32 percent of the greenhouses have glass or glazing material as a covering, 41 percent have polyethylene, 24 percent have fiberglass and the remaining three percent have polycarbonate.

Statistics Canada also conducts a survey of the greenhouse industry every year to identify the number of commercial operations in the province, crops grown and the total output of crops produced in a controlled environment.

In 1988, although all greenhouse operations in Alberta were contacted by Statistics Canada, only 76 firms reported on their operations. The area reported by these firms was 3,569 million square feet, which is about half of the area reported in the 1986 census. In 1984, the number of firms reporting on their operations was 109. Greenhouse area reported by these firms was 2,755 million square feet. In 1985 the number of firms returning Statistics Canada questionnaires decreased to 106 and the overall area reported by these firms also.

Table 4 lists the types of crops grown in greenhouses across the province. The only greenhouses growing a single crop are ones producing vegetables and a few of these also grow bedding plants. A considerable number of greenhouses produce more than one crop.

Greenhouses surveyed for the 2000-2001 crop year were selected to obtain production costs and returns data for all major greenhouse crops including tree seedlings for the forestry industry. Greenhouses producing a variety of crops were in operation year round, whereas the vegetable greenhouses were in operation for about 10 months, February through November. Those producing bedding plants were in operation for about five months, February to June.

TABLE 4

Distribution of Greenhouse Area by Crops

Greenhouse Crops	No. of Growers	Area (Sq. ft.)	Area (m^2)
Vegetables			
Cucumbers	76	2,369,585	220 221
Tomatoes	68	958,399	89 071
Egg Plant	2	2,000	186
Peppers	28	462,457	42 979
Lettuce	9	108,750	10 107
Other Crops	6	85,032	7 903
Sub-Total	**189***	**3,936,223**	**365 820**
Floriculture			
Bedding Plants	265	3,018,041	280 487
Potted Flowers & Ornamentals	53	628,480	58 409
Cut Flowers	26	467,350	43 434
Herbs	40	184,173	17 116
Perennials	170	1,230,914	114 397
Sub-Total	**554***	**5,505,358**	**511 650**
Tree Seedlings	**27**	**2,282,770**	**212 153**
TOTAL	**770***	**11,797,951**	**1 096 464**

*Growers producing multiple crops. Actual number of growers surveyed for crops grown was 386.

Marketing of Greenhouse Produce

Greenhouse operators surveyed for the 2000-2001 crop year used several channels to market their produce. The most important of these were retail facilities owned by greenhouse operators, either attached to the greenhouses or located in an urban area; other retail and wholesale facilities; the Co-op at Redcliff; and farmers' markets in various centers. The Red Hat

Co-op at Redcliff serves as the focal point for the marketing of Long English cucumbers grown in and around Medicine Hat and Redcliff. Cucumber producers in north-central Alberta market their produce through Pick-N-Pack (a cooperative of growers in Lacombe). Greenhouse operators pay a commission or fee set by the Board of Directors of the Co-ops to cover grading, packaging, storage, marketing and administration costs.

In north-central Alberta, greenhouses producing vegetables and bedding plants sold a large percentage of their produce at the gate and through rented stalls and booths in shopping centers and at farmers' markets. Farmers' markets have become popular marketing outlets, especially during the bedding plant season.

Physical Characteristics of Greenhouses

Greenhouses in Alberta range from small sash roof "lean-to" houses constructed of a wood-frame sash, to large modern steel frame houses with truss supported roofs. Most new greenhouses are made of steel, wood or masonry covered with either glass, fiberglass, double plastic or a single layer of plastic. A survey by the Alberta greenhouse industry in 2000 reported just under 12 million square feet (1 096 464 square metres) of greenhouse area in Alberta. The number of greenhouse operations surveyed was 386. During the last decade the greenhouse industry in Alberta has more than doubled. New greenhouse operations are equipped with most modern and efficient crop production tools.

The major internal features of greenhouse systems in Alberta are as follows:

Heating Systems:

A year round greenhouse operation is heated, using natural gas, steam, propane or coal to maintain optimum temperatures for crops grown during the winter months. Some vegetable producing greenhouses operate 10 months of the year and close down during December and January. Natural gas burners heat almost all of the greenhouses in southern Alberta and when combined with stovepipes these burners provide sufficient heating through natural air movement. Greenhouses in northern Alberta are equipped with natural gas boilers and hot water pipes for heating. All boiler-heating systems have automatic temperature control devices.

In addition to heating systems, most greenhouses in Alberta are equipped with a pad and fan cooling system. The cooling system is essential if temperatures are to be lowered during the hot summer months.

Table 5 presents the various types of heating systems used in greenhouse operations in the province. In some cases a grower has more than one heating system.

Watering Systems:

The watering of ground beds is usually done by the use of soaker hoses, which run parallel to each side of the bed. Bench beds and potted plants are usually watered with the use of chapin tubes. Other operations may use water supply pipes along with garden hoses.

Supplementary Lighting:

Very few greenhouses have supplementary lighting. Those that do, make use of ordinary lamps, usually five to six feet apart. Supplementary lighting is mostly used for producing chrysanthemums.

TABLE 5

Type of Heating Systems Used in Greenhouses		
Responses	**Systems**	**Percent of Responses**
285	Natural Gas Furnace	88
102	Hot Water	31
48	Steam	15
31	In-floor heating	10
16	Propane Furnace	5
8	Soil Heating	2
7	Electric	2
5	Stove Pipe Heater	2
4	Coal Deckker	1
2	Bio-therm	1

N=324

Greenhouse Crops

Greenhouses in Alberta produce many kinds of flowers; chrysanthemums, roses and geraniums being the most common potted plants. Outdoor flowers such as petunias and marigolds are also produced in these greenhouses. Some greenhouse operations concentrate on importing tropical plants, which are acclimatized to Alberta conditions before resale. The most commonly grown greenhouse vegetables are cucumbers, tomatoes and lettuce. During the last few years' attempts have been made to grow peppers, eggplants, cauliflower, cabbage and Chinese vegetables, as well as other crops.

SECTION III

Greenhouse Production Costs and Returns

Computation of Individual Cost Components

Interest on Investment:

Interest is defined as a sum paid or calculated for the use of capital. The sum is usually expressed in terms of a rate or percentage of the capital involved, called the interest rate.

Interest is charged for the use of investment capital. Had the capital not been invested to buy a specific asset, it could have been used elsewhere, either within or outside the firm and would have brought some additional return to the firm. However, for the purposes of this study, actual paid capital interest was used to arrive at capital costs.

Depreciation:

Depreciation is defined as the loss in value of an asset over time, mainly as a result of obsolescence. In the case of buildings and equipment, it is that portion of the decrease in value resulting from the passage of time. Obviously, part of the reduced value of the buildings and equipment is the result of usage and is considered a variable cost. The entire depreciation is considered a fixed cost.

In computing depreciation, a 10 percent allowance or salvage value is taken from the purchase price of the buildings and equipment. The following formula was used in arriving at depreciation for buildings and equipment.

$$\text{Depreciation} = \frac{\text{Purchase Price} - \text{Salvage Value}}{\text{Number of Years of Life}}$$

Land Value:

Land associated with each greenhouse operation was valued at $3,000 per acre, irrespective of its location. This value was determined through real estate values for good farmland suitable for a greenhouse operation. It can be argued that allocation of such a value distorts cost of land in and around urban areas relative to farmland. However, for uniformity and reasonable cost estimates, it was decided to standardize the land value regardless of its location. Researchers are aware that land values in cities or towns are much higher than $3,000 per acre, but if market values were used for land acquired ten years ago, it would lead to artificially high fixed costs that would greatly inflate overall production costs. Most of the greenhouse operators surveyed have been in business for quite some time, with the exception of a few who got started within the last eight years or so.

Property and Business Taxes:

Taxes on real estate include payments made on the assessed value of the greenhouse operation less any assessment for the greenhouse operator's residence or operations other than the greenhouse. There is a business tax on greenhouses located in urban municipalities. Exact amounts of property and business taxes were included in the costs.

Labour Costs:

Hired labour costs included the amount of wages and any benefits received by the hired workers, such as contributions to Workers' Compensation, Canada Pension Plan, and Unemployment Insurance.

The hours spent by the operator and his/her families in greenhouse production were estimated. An operator's labour was valued at $10.50 per hour and family labour was valued at either the rate paid to hired labour or the actual amount paid to family members.

Production Materials and Supplies:

Production materials and supplies included the purchase of cuttings, seed plants, fertilizers, chemicals, soils, vermiculite, perlite, peat moss, straw, peat pots and plastic. Costs of production materials and supplies were the actual figures provided by the study participants.

Heating Costs:

Almost all greenhouse operators had reasonably accurate costs for heating the greenhouses with natural gas. Monthly bills were helpful in arriving at the total heating costs. A sudden increase in natural gas costs during the fall of 2000 prompted major concerns for economic viability of the greenhouse industry at that time.

Utility Costs:

Utility costs included electricity, telephone and water. Where the utility bill was combined with the greenhouse operator's residence, the operator was asked to apportion the bill to arrive at total utility costs for the greenhouse operation.

Transportation Expenses:

Expenses for trucks or other vehicles owned by greenhouse operators were apportioned according to their use in the greenhouse operation, personal and leisure driving. Freight charges paid to commercial or private carriers for hauling greenhouse produce or supplies were included in the transportation expenses.

Repairs and Maintenance Costs:

Maintenance costs included repairs to greenhouse structures, boilers, heating equipment, tractors and all other machinery and equipment associated with the greenhouse operation.

Marketing Charges:

Marketing charges were the actual amount paid by each greenhouse operator for having produce marketed through the Redcliff and Edmonton Co-ops. These charges covered grading, packaging, marketing and administrative fees. The charges paid by each grower were included as a cost item in the study.

Miscellaneous Costs:

These costs include legal and accounting fees, office supplies, bad debts, donations, membership fees, insurance costs and other costs incurred in a greenhouse operation, but not reported under any other heading.

SECTION IV

Greenhouse Production Costs and Returns for Cucumbers

In 2000, cucumber production represented about 20 percent of the greenhouse area in Alberta. Long English cucumbers are the second largest crop produced in a controlled environment after bedding plants. Almost 75 percent of greenhouse cucumber production is in the greenhouse capital of Alberta – the Medicine Hat and Redcliff area.

Production costs and returns presented in Tables 6 and 7 are based on data obtained from ten greenhouse cucumber producers across the province (southern and central Alberta). However, most of the greenhouse operations surveyed in 2001 were from the Medicine Hat and Redcliff area.

Production costs include operating costs, investment costs, depreciation (buildings, equipment and automotives) and operator's labour. For any enterprise or operation to be economically viable, it must recover operating costs.

Investment for Cucumber Producing Greenhouses

The average greenhouse area for the ten cucumber producing greenhouses was 55,161 square feet for the 2000 – 2001 crop year. It was significantly higher than the industry average of 31, 179 square feet. Land area associated with cucumber producing greenhouses was estimated at just over six acres. Value of land associated with these greenhouses was calculated to be $18,560 or $0.34 per square foot of greenhouse area.

The average investment in greenhouse buildings for cucumber producing greenhouses amounted to $346,800 per greenhouse ($6.29 per square foot). Average investment in machinery and equipment was reported at $327,622 per greenhouse ($5.94 per square foot). When land, buildings, machinery and equipment investments were combined, total investment was estimated at $692,982 per greenhouse. In terms of dollars per square foot, it was $12.56. Details on land, building, machinery and equipment investment and depreciation are given in Table 6.

Greenhouse Production Costs and Returns for Cucumbers

Gross Return:

Gross return (A) represents sales of cucumbers through the coops and other market outlets. Gross revenue for an average greenhouse with production area of 53,351 square feet was estimated at $314,008 or $5.89 per square foot. When crop insurance receipts were included to cucumber sales, total gross revenue for greenhouse cucumber production increased to $320,408 or $6.01 per square foot. Details on gross return are presented in Table 7.

Variable Costs:

Variable costs (B) include all out-of-pocket costs and unpaid labour, which amounted to $274,623 per greenhouse with average production area of 53,351 square feet (4 958m^2). In terms of variable costs per square foot, these were estimated at $5.51 for producing cucumbers in a

Table 6

Average Investment for Cucumber Producing Greenhouses, 2000

Greenhouse Area: 55,161.2 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	18,560.00	.34
Buildings	346,800.00	6.29
Machinery & Equipment	327,622.10	5.94
TOTAL INVESTMENT	692,982.10	12.56

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	18,560.00		
Greenhouse Buildings:	346,800.00	5.2	12,138.00
Equipment:			
Refrigeration / Freezer Storage	.00	.0	.00
Warehouses / Storage Sheds	34,000.00	8.1	1,700.00
Fuel Tanks	200.00	1.5	10.00
Houses(25%)	5,725.00	16.6	286.25
Other Buildings	19,300.00	3.1	965.00
Lighting	1,960.00	4.3	98.00
Heating System	126,580.00	7.7	6,329.00
Ventilation System	29,567.10	6.0	1,478.36
Humidity Control	6,560.00	2.1	328.00
Benches	1,600.00	1.0	80.00
Irrigation System	16,900.00	6.8	1,690.00
Water Pumps / Sand Filters	3,800.00	3.5	380.00
Soil Mixers / Flat Fillers /Seedling Lines	.00	.0	.00
Generators	8,760.00	7.4	876.00
Roto-Tillers	1,410.00	.8	141.00
Storage / Mixing Tanks	6,035.00	5.3	603.50
Sterilizers	.00	.0	.00
Sprayers	6,830.00	4.7	683.00
Carts / Dolleys	3,825.00	5.7	382.50
Fertilizer Injectors	4,670.00	5.8	467.00
Small Tools / Hardware	10,720.00	6.0	1,072.00
Sub-Total	288,442.10		17,569.61
Machinery & Vehicles			
Bobcats / Forklifts	5,380.00	3.1	538.00
Trucks	33,800.00	11.4	3,380.00
Other Machinery	.00	.0	.00
Sub-Total	39,180.00		3,918.00

Table 7

Production Costs and Returns for Cucumber Producing Greenhouses, 2000

Production Area: 53,351.2 sq.ft.

Number of producers: 10

			Total $	$/sq. ft.
(A)				
	1. Crop Sales - Imputed Value of Production		314,007.99	5.89
	2. Crop Insurance Receipts		6,400.00	.12
	3. Miscellaneous Receipts		.00	.00
	GROSS RETURN		**320,407.99**	**6.01**
(B)				
	1. Growing Media, Seed/Cuttings		20,466.14	.38
	2. Fertilizer & Chemicals		18,959.20	.36
	3. Greenhouse Insurance		8,187.48	.15
	4. Trays, Boxes & Other Packaging		5,461.70	.10
	5. Freight and /or Trucking Costs		750.00	.01
	6. Auto Fuel, Repairs, Licenses & Auto Ins.		6,512.40	.12
	7. Repairs - Buildings and Equipments		11,298.73	.21
	8. Utilities: Natural Gas	0.00 GJ	51,614.74	.97
	9. Electricity	0.00 KW	10,362.56	.19
	10. Water	0.00 M^3	4,351.90	.08
	11. Phone		1,162.10	.02
	12. Custom Work & Specialized Labour		341.35	.01
	13. Marketing Costs		52,828.01	.99
	14. Assoc. Dues, Prof'l Fees & Promotion		3,791.80	.07
	15. Small Tools, Supplies & Misc. Expenses		2,998.80	.06
	16. Operating Interest Paid		4,405.96	.08
	17. Labour Insurance / Benefits		3,469.15	.07
	18. Hired Labour	4,874.40 hours	43,209.93	.81
	19. Unpaid Labour	2,345.12 hours	24,451.96	.46
	VARIABLE COSTS		**274,623.92**	**5.15**
(C)				
	1. Property / Business taxes		7,608.38	.14
	2. Equipment & Building	a) Depreciation	33,625.60	.63
		b) Lease Payments	600.00	.01
	3. Paid Capital Interest		25,638.40	.48
	TOTAL CAPITAL COSTS		**67,472.38**	**1.26**
(D)	**CASH COSTS**	(B+C-B19-C2a)	**284,018.73**	**5.32**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)	**342,096.30**	**6.41**
(F)	**GROSS MARGIN**	(A-D)	**36,389.26**	**.68**
	RETURN TO UNPAID LABOUR	(A-E+B19)	**2,763.65**	**.05**
	RETURN TO INVESTMENT	(A-E+C2a) 1.7 %	**11,937.30**	**.22**
	RETURN TO EQUITY	(A-E)	**(21,688.31)**	**(.41)**

greenhouse. Because of producers' interest in knowing their variable costs for each basic unit of production, these costs were broken into as much detail as possible. The most significant cost items were marketing costs, natural gas costs, followed by hired labour, unpaid labour expenses, seed, fertilizer and chemical costs.

Capital Costs:

Capital costs (C) were comprised of property/business taxes, equipment and building depreciation, lease payments and actual capital interest paid. Average total capital cost amounted to $67,437 per greenhouse or $1.26 per square foot for greenhouse cucumber production in 2000.

Cash Costs:

Cash costs (D) include all out-of-pocket costs except unpaid labour and equipment and building depreciation. These costs amounted to $284,019 per average greenhouse (53,351 square feet) or $5.32 per square foot.

Total Production Costs:

Average total production costs for cucumber producing greenhouse were estimated at $342,061. These costs were $6.41 per square foot. Details on the total production costs for greenhouse cucumber production are presented in Table 7. Figure 2 shows the relative proportion of all costs for greenhouse cucumber production for the 2000-2001 crop year.

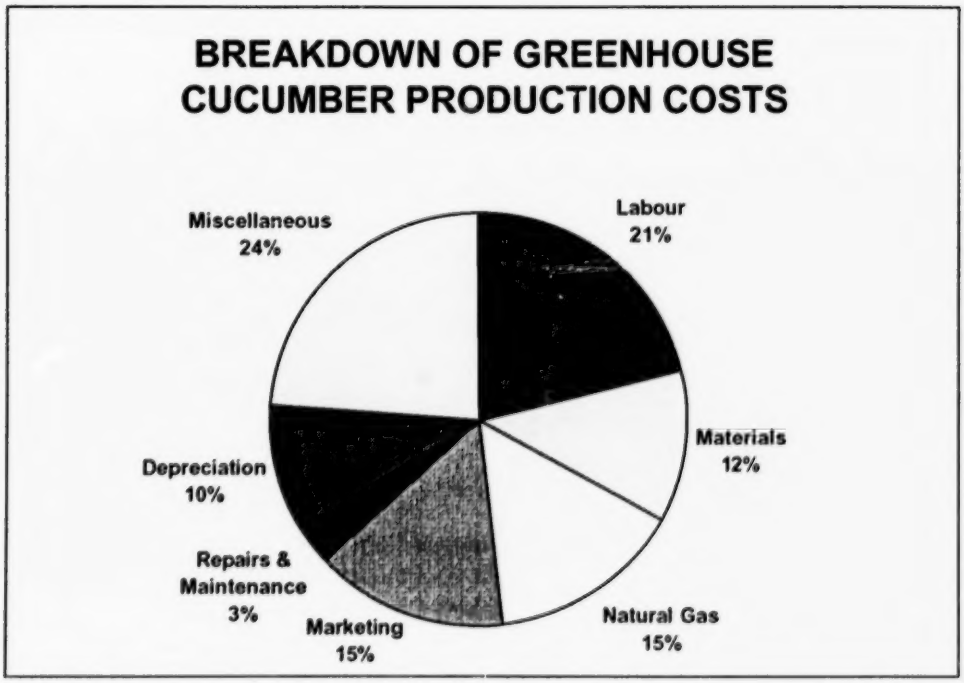
Management Indicators:

Gross Margin – when cash costs (D) were deducted from gross return (A-D), average greenhouse cucumber producer showed a positive gross margin of $36,389 ($0.68 per square foot). A positive gross margin indicates that the enterprise is economically feasible.

Average return to unpaid labour amounted to $2,799 per greenhouse producing cucumbers. In terms of per square foot it was $0.05 ($0.54 per m^2).

Average return to investment was also positive at $11,937 per greenhouse ($0.22 per square foot). However, return to equity was negative at $21,688 per greenhouse or $0.41 per square foot.

Figure 2


BREAKDOWN OF GREENHOUSE CUCUMBER PRODUCTION COSTS
Labour 21%
Materials 12%
Natural Gas 15%
Marketing 15%
Repairs & Maintenance 3%
Depreciation 10%
Miscellaneous 24%

SECTION V

Greenhouse Production Costs and Returns for Tomatoes

Greenhouse tomato production has more than doubled during the last decade. The Greenhouse area under tomato production was 958,399 square feet (89 071 m^2) or 22 acres in 2000. It represents about eight percent of the greenhouse area in Alberta. The number of greenhouse operations producing tomatoes was reported at 68 in the 2000 survey of this industry.

Data on the greenhouse production costs and returns for tomatoes was obtained from seven greenhouse operations across the province. Although the sample size for tomato production costs and returns was relatively small, information presented in the following two tables can be used for guideline purposes.

Investment for Greenhouses Producing Tomatoes

Greenhouse investment data for tomato production was obtained from seven greenhouse operations across the province. Average size of greenhouse area for tomato producing greenhouses was 37,201 square feet. Average land area associated with these greenhouses was about five acres valued at $14,786 or $0.40 per square foot.

Buildings investment for tomato producing greenhouses was reported at $275,971 or $7.42 per square foot. Machinery and equipment investment for these greenhouse amounted to $235,796 per greenhouse or $6.34 per square foot. A detailed breakdown of land, buildings, machinery and equipment investment are presented in Table 8. Total investment for tomato producing greenhouses was estimated at $526,553 or $14.15 per square foot.

Greenhouse Production Costs and Returns for Tomatoes

Gross Return:

Gross return (A) represents tomato sales and some miscellaneous receipts (wage subsidy, dividend, etc.) during the 2000-2001 crop year. It amounted to $271,071 per average tomato greenhouse with 35,204 square foot production area or $7.70 per square foot.

Variable Costs:

Variable costs (B) including unpaid labour amounted to $231,880 per greenhouse ($6.59 per square foot). The most significant cost items for greenhouse tomato production were natural gas costs at $1.60 per square foot followed by hired labour at $1.32, marketing costs at $1.07 and fertilizer and chemicals at $0.61 per square foot. Detailed breakdown of all variable costs are presented in Table 9.

Capital Costs:

Capital costs (C) were comprised of property/business taxes, equipment and building depreciation, lease payments and actual capital interest paid. The average total capital costs for a tomato-producing greenhouse was $50,191 or $1.43 per square foot. Almost half of the capital cost was equipment and building depreciation.

Table 8

Average Investment for Tomato Producing Greenhouses, 2000

Greenhouse Area: 37,201.4 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	14,785.71	.40
Buildings	275,971.43	7.42
Machinery & Equipment	235,795.74	6.34
TOTAL INVESTMENT	**526,552.89**	**14.15**

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	**14,785.71**		
Greenhouse Buildings:	**275,971.43**	**4.6**	**9,659.00**
Equipment:			
Refrigeration / Freezer Storage	285.71	.8	14.29
Warehouses / Storage Sheds	6,571.43	3.1	328.57
Fuel Tanks	.00	.0	.00
Houses(25%)	6,285.71	8.7	314.29
Other Buildings	4,995.74	.6	249.79
Lighting	9,785.71	3.6	489.29
Heating System	96,071.43	6.4	4,803.57
Ventilation System	23,357.14	4.8	1,167.86
Humidity Control	7,857.14	1.3	392.86
Benches	28.57	.1	1.43
Irrigation System	14,357.14	2.5	1,435.71
Water Pumps / Sand Filters	3,028.57	2.4	302.86
Soil Mixers / Flat Fillers /Seedling Lines	.00	.0	.00
Generators	5,328.57	8.6	532.86
Roto-Tillers	342.86	1.7	34.29
Storage / Mixing Tanks	1,385.71	3.2	138.57
Sterilizers	.00	.0	.00
Sprayers	1,571.43	1.6	157.14
Carts / Dolleys	9,085.71	2.1	908.57
Fertilizer Injectors	2,400.00	3.9	240.00
Small Tools / Hardware	11,214.29	4.1	1,121.43
Sub-Total	**203,952.89**		**12,633.36**
Machinery & Vehicles			
Bobcats / Forklifts	6,571.43	3.9	657.14
Trucks	21,557.14	12.0	2,155.71
Other Machinery	3,714.29	4.7	371.43
Sub-Total	**31,842.86**		**3,184.29**

Table 9

Production Costs and Returns for Tomato Producing Greenhouses, 2000

Production Area: 35,203.6 sq.ft.

Number of producers: 7

				Total $	$/sq. ft.
(A)					
	1. Crop Sales - Imputed Value of Production			268,868.55	7.64
	2. Crop Insurance Receipts			.00	.00
	3. Miscellaneous Receipts			2,202.71	.06
	GROSS RETURN			**271,071.27**	**7.70**
(B)					
	1. Growing Media, Seed/Cuttings			15,019.23	.43
	2. Fertilizer & Chemicals			21,496.12	.61
	3. Greenhouse Insurance			5,561.76	.16
	4. Trays, Boxes & Other Packaging			1,967.86	.06
	5. Freight and /or Trucking Costs			855.54	.02
	6. Auto Fuel, Repairs, Licenses & Auto Ins.			6,052.72	.17
	7. Repairs - Buildings and Equipments			6,183.04	.18
	8. Utilities: Natural Gas	0.00 GJ		56,448.12	1.60
	9. Electricity	0.00 KW		10,470.71	.30
	10. Water	0.00 M^3		1,586.00	.05
	11. Phone			1,213.75	.03
	12. Custom Work & Specialized Labour			263.57	.01
	13. Marketing Costs			37,730.14	1.07
	14. Assoc. Dues, Prof'l Fees & Promotion			1,385.87	.04
	15. Small Tools, Supplies & Misc. Expenses			2,571.39	.07
	16. Operating Interest Paid			3,148.00	.09
	17. Labour Insurance / Benefits			1,582.16	.04
	18. Hired Labour	6,347.04 hours		46,538.31	1.32
	19. Unpaid Labour	1,270.00 hours		11,805.71	.34
	VARIABLE COSTS			**231,880.02**	**6.59**
(C)					
	1. Property / Business taxes			2,682.11	.08
	2. Equipment & Building	a) Depreciation		25,476.64	.72
		b) Lease Payments		2,997.71	.09
	3. Paid Capital Interest			19,034.31	.54
	TOTAL CAPITAL COSTS			**50,190.78**	**1.43**
(D)	**CASH COSTS**	(B+C-B19-C2a)		**244,788.43**	**6.95**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)		**282,070.79**	**8.01**
(F)	**GROSS MARGIN**	(A-D)		**26,282.83**	**.75**
	RETURN TO UNPAID LABOUR	(A-E+B19)		**806.19**	**.02**
	RETURN TO INVESTMENT	(A-E+C2a)	2.7 %	**14,477.12**	**.41**
	RETURN TO EQUITY	(A-E)		**(10,999.53)**	**(.31)**

Cash Costs:

Cash Costs (D) comprise of out-of-pocket costs incurred during the tomato production period. These costs were estimated at $244,788 per average tomato producing greenhouse with a production area of 35,204 square feet. In terms of per square foot, these costs were $6.95.

Total Production Costs:

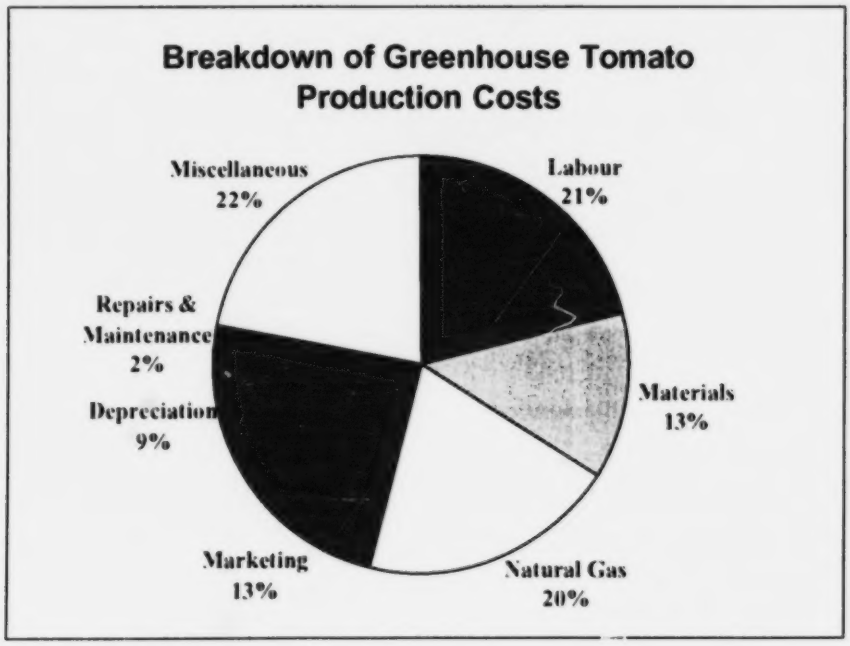
Average total production costs for tomato producing greenhouse were calculated to be $282,071 or $8.01 per square foot for the 2000-2001 crop year. The most significant cost items for tomato production was natural gas costs at 20 percent, followed by hired labour at 16 percent and marketing costs at 13 percent. Details on various costs are presented in Table 9. Figure 3 presents the breakdown of major product costs for greenhouse tomato production.

Management Indicators:

Management indicators in this report present data on gross margin, returns to unpaid labour, investment and equity. Gross margin (F) is based on gross return (A) less cash costs (D). For an average tomato-producing greenhouse, gross margin was positive at $26,283 or $0.75 per square foot.

Average return to unpaid labour was marginally positive at $806 per greenhouse or $0.02 per square foot. Average return to investment was estimated at 2.7 percent. In terms of dollars per greenhouse it was $14,477 or $0.41 per square foot. Average return to equity was negative at $11,000 per tomato-producing greenhouse ($0.31 per square foot). Details on management indicators are presented in Table 9.

Figure 3



SECTION VI

Greenhouse Production Costs and Returns for Peppers

Greenhouse pepper production in Alberta has increased significantly during the last 5 to7 years. At the start of the nineties there were a very few greenhouse operations which produced peppers. The 2000 greenhouse industry survey reported 28 operations producing peppers. Greenhouse pepper production represents four percent of the total greenhouse area in the province and about 12 percent of the area under vegetables.

Investment production costs and returns presented in Tables 10 and 11 were obtained from five greenhouse operations across the province. Data was collected during the winter and spring of 2001 on peppers produced during the 2000-2001 crop year.

Investment for Greenhouses Producing Peppers

Greenhouse investment data was obtained from five pepper producing greenhouse operations in the province. Each operator was asked to value the greenhouse structure based on the current market costs of replacement. In order to calculate depreciation of buildings, machinery and equipment, they were also asked to provide an estimate on life of the structure and equipment.

Average land area associated with greenhouses producing peppers was just under nine acres. It was valued at $26,280 or $0.60 per square foot. Average greenhouse area for pepper production was reported at 43,988 square feet for the 2000 – 2001 crop year.

Buildings investment for pepper producing greenhouses was reported at $348,520 per greenhouse or $7.92 per square foot. Machinery and equipment investment for this greenhouse was estimated at $265,725 or $6.04 per square foot. When land, buildings, machinery and equipment investments were combined, total investment for pepper producing greenhouses amounted to $640,525 or $14.56 per square of greenhouse area. Details on land, buildings, machinery and equipment investments are provided in Table 10.

Greenhouse Production Costs and Returns for Peppers

Gross Return:

Gross return (A) represents total value of crop sales during the crop year. Gross return from an average greenhouse producing peppers was $319,854 or $8.65 per square foot. The average size of the greenhouse was 36,965 square feet. Among the three major greenhouse vegetables (cucumbers, tomatoes and peppers), peppers showed higher return per square foot.

Variable Costs:

Variable costs (B) for greenhouses producing peppers amounted to $214, 206 or $5.79 per square foot. Among all the costs, natural gas was the highest at $1.09, followed closely by marketing costs at $1.08 and hired labour at $0.92 per square foot. Meanwhile, other significant

Table 10

Average Investment for Pepper Producing Greenhouses, 2000
Greenhouse Area: 43,988.0 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	26,280.00	.60
Buildings	348,520.00	7.92
Machinery & Equipment	265,725.00	6.04
TOTAL INVESTMENT	**640,525.00**	**14.56**

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	**26,280.00**		
Greenhouse Buildings:	**348,520.00**	3.7	**12,198.20**
Equipment:			
Refrigeration / Freezer Storage	20.00	2.0	1.00
Warehouses / Storage Sheds	6,600.00	7.6	330.00
Fuel Tanks	220.00	4.8	11.00
Houses(25%)	6,075.00	25.6	303.75
Other Buildings	13,600.00	2.4	680.00
Lighting	8,500.00	2.4	425.00
Heating System	115,900.00	3.4	5,795.00
Ventilation System	8,300.00	3.8	415.00
Humidity Control	13,240.00	.6	662.00
Benches	.00	.0	.00
Irrigation System	18,840.00	3.8	1,884.00
Water Pumps / Sand Filters	3,320.00	3.9	332.00
Soil Mixers / Flat Fillers /Seedling Lines	.00	.0	.00
Generators	12,120.00	5.8	1,212.00
Roto-Tillers	.00	.0	.00
Storage / Mixing Tanks	4,500.00	4.2	450.00
Sterilizers	.00	.0	.00
Sprayers	1,660.00	4.4	166.00
Carts / Dolleys	10,540.00	4.5	1,054.00
Fertilizer Injectors	3,350.00	2.9	335.00
Small Tools / Hardware	10,100.00	4.4	1,010.00
Sub-Total	**236,885.00**		**15,065.75**
Machinery & Vehicles			
Bobcats / Forklifts	5,600.00	.0	560.00
Trucks	21,460.00	9.4	2,146.00
Other Machinery	1,780.00	1.2	178.00
Sub-Total	**28,840.00**		**2,884.00**

Table 11

Production Costs and Returns for Pepper Producing Greenhouses, 2000

Production Area: 36,964.8 sq.ft.

Number of producers: 5

				Total $	$/sq. ft.
(A)					
	1. Crop Sales - Imputed Value of Production			319,853.60	8.65
	2. Crop Insurance Receipts			.00	.00
	3. Miscellaneous Receipts			.00	.00
	GROSS RETURN			**319,853.60**	**8.65**
(B)					
	1. Growing Media, Seed/Cuttings			23,058.00	.62
	2. Fertilizer & Chemicals			18,255.60	.49
	3. Greenhouse Insurance			5,269.40	.14
	4. Trays, Boxes & Other Packaging			2,010.00	.05
	5. Freight and /or Trucking Costs			450.00	.01
	6. Auto Fuel, Repairs, Licenses & Auto Ins.			3,470.00	.09
	7. Repairs - Buildings and Equipments			1,960.00	.05
	8. Utilities: Natural Gas	0.00 GJ		40,150.00	1.09
	9. Electricity	0.00 KW		5,735.20	.16
	10. Water	0.00 M^3		1,840.00	.05
	11. Phone			983.20	.03
	12. Custom Work & Specialized Labour			200.00	.01
	13. Marketing Costs			39,916.12	1.08
	14. Assoc. Dues, Profl Fees & Promotion			1,740.00	.05
	15. Small Tools, Supplies & Misc. Expenses			1,530.00	.04
	16. Operating Interest Paid			1,780.00	.05
	17. Labour Insurance / Benefits			9,006.00	.24
	18. Hired Labour	4,312.27 hours		33,896.00	.92
	19. Unpaid Labour	2,224.40 hours		22,956.40	.62
	VARIABLE COSTS			**214,205.92**	**5.79**
(C)					
	1. Property / Business taxes			2,960.00	.08
	2. Equipment & Building	a) Depreciation		30,147.95	.82
		b) Lease Payments		1,400.00	.04
	3. Paid Capital Interest			19,110.00	.52
	TOTAL CAPITAL COSTS			**53,617.95**	**1.45**
(D)	**CASH COSTS**	(B+C-B19-C2a)		**214,719.52**	**5.81**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)		**267,823.87**	**7.25**
(F)	**GROSS MARGIN**	(A-D)		**105,134.08**	**2.84**
	RETURN TO UNPAID LABOUR	(A-E+B19)		**74,986.13**	**2.03**
	RETURN TO INVESTMENT	(A-E+C2a)	12.8 %	**82,177.68**	**2.22**
	RETURN TO EQUITY	(A-E)		**52,029.73**	**1.41**

costs were growing such as: media and seed, unpaid labour, fertilizer and chemicals. A detailed breakdown of these costs is presented in Table11.

Capital Costs:

Capital costs (C) were made up of property/business taxes, equipment and building depreciation and paid capital interest. An average total capital cost per greenhouse producing peppers amounted to $53,618 or $1.45 per square foot.

Cash Costs:

Cash costs (D) represent all costs incurred during the crop production period less unpaid labour, equipment and building depreciation. These costs were estimated at $214,720 per average greenhouse or $5.81 per square foot for pepper production.

Total Production Costs:

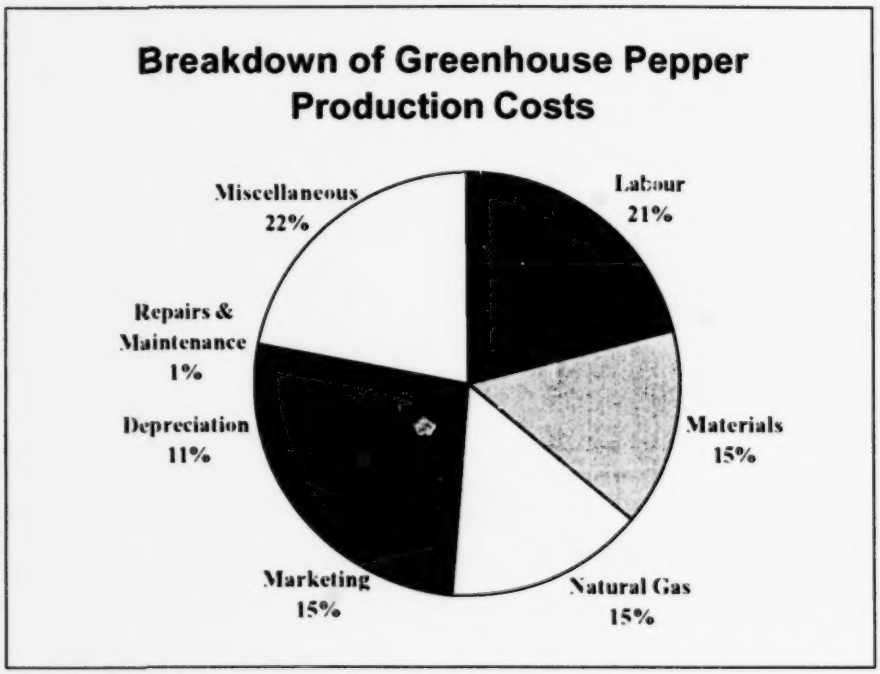
Average total production costs for pepper producing greenhouses amounted to $267,824 or $7.25 per square foot. Average size of the greenhouse producing peppers was 36,965 square feet. Details on total production costs are presented in Table 11. Figure 4 shows a breakdown of major production costs for greenhouse pepper production.

Management Indicators:

Gross margin (F) -when cash costs (D) were deducted from gross return (A), average greenhouse producing peppers showed a positive gross margin of $105,134 or $2.84 per square foot. Among the three greenhouse producing vegetable crops, peppers showed the highest gross margin per square foot compared to cucumbers and tomatoes.

Average return to unpaid labour was also significantly higher for peppers at $74,986 per greenhouse or $2.03 per square foot. The average return to investment was calculated at 12.8 percent. The return to investment for a pepper-producing greenhouse was $82,178 or $2.22 per square foot. Average return to equity was positive at $52,030 per greenhouse ($1.41 per square foot). Details on management indicators are presented in Table 11.

Figure 4


Breakdown of Greenhouse Pepper Production Costs
Miscellaneous 22%
Labour 21%
Repairs & Maintenance 1%
Depreciation 11%
Materials 15%
Marketing 15%
Natural Gas 15%

SECTION VII

Greenhouse Production Costs and Returns for Bedding Plants/Ornamentals

Greenhouse bedding plants production in Alberta has been increasing steadily over the years despite competition from cheap imports from British Columbia and south of the border. During the 2000 greenhouse industry survey, the area under greenhouse bedding plants was reported just over 3 million square feet or 26 percent of the total greenhouse area in the province. Number of greenhouse operations producing bedding plants was reported at 265.

Greenhouse production of potted flowers and ornamentals was estimated at 628,480 square feet or about five percent of the greenhouse area in Alberta in 2000. When this area was combined with the area under the greenhouse bedding plants, total area under these crops was 3,646,521 square feet or about 84 acres. It represented about 31 percent of the greenhouse area in Alberta.

Investment and production costs and returns data presented in Tables 12 and 13 were obtained from seven greenhouse operations across the province. Although the sample size for the group of greenhouse operations was relatively small, yet the results should be considered as useful guidelines for information and planning purposes.

Investment for Greenhouses Producing Bedding Plants/Ornamentals

Greenhouse investment data was obtained directly from study participants through personal survey. Each operator was asked to value the greenhouse structure based on the current market costs of replacement. They were also asked to provide an estimate on life of the structure to calculate depreciation costs for buildings and equipment.

Average land area associated with greenhouse operations producing bedding plants and ornamentals was just below eight acres. Land was valued at $3,000 per acre, as it had to be located close to all services required for a greenhouse operation. Total land cost was estimated at $23,537 per average greenhouse area of 30,978 square feet or $0.76 per square foot.

Building investment for the above sized greenhouse amounted to $133,085 or $4.30 per square foot. Machinery and equipment investment was estimated at $167,871 per average greenhouse ($5.42 per square foot). A detailed breakdown of land, buildings, machinery and equipment investment is presented in Table 12. It amounted to $324,493 per average greenhouse operation producing bedding plants and ornamentals. In terms of dollars per square foot, investment was estimated at $10.47.

Table 12

Average Investment for Bedding Plant/ Ornamental Greenhouses, 2000
Greenhouse Area: 30,978.3 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	23,537.14	.76
Buildings	133,085.29	4.30
Machinery & Equipment	167,870.93	5.42
TOTAL INVESTMENT	**324,493.36**	**10.47**

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	**23,537.14**		
Greenhouse Buildings:	**133,085.29**	**12.7**	**4,657.98**
Equipment:			
Refrigeration / Freezer Storage	2,071.43	4.1	103.57
Warehouses / Storage Sheds	21,785.71	18.4	1,089.29
Fuel Tanks	227.14	2.7	11.36
Houses(25%)	7,053.57	23.3	352.68
Other Buildings	14,450.00	6.1	722.50
Lighting	3,341.43	3.0	167.07
Heating System	44,357.14	9.3	2,217.86
Ventilation System	5,607.14	9.4	280.36
Humidity Control	.00	.0	.00
Benches	14,611.57	9.6	730.58
Irrigation System	2,814.29	2.6	281.43
Water Pumps / Sand Filters	1,871.43	3.9	187.14
Soil Mixers / Flat Fillers /Seedling Lines	4,985.71	3.5	498.57
Generators	3,714.29	8.1	371.43
Roto-Tillers	2,135.79	5.8	213.58
Storage / Mixing Tanks	1,520.71	5.3	152.07
Sterilizers	142.86	2.1	14.29
Sprayers	713.57	4.1	71.36
Carts / Dolleys	8,827.86	6.5	882.79
Fertilizer Injectors	1,114.29	3.9	111.43
Small Tools / Hardware	2,067.86	4.9	206.79
Sub-Total	**143,413.79**		**8,666.12**
Machinery & Vehicles			
Bobcats / Forklifts	1,142.86	1.4	114.29
Trucks	23,314.29	9.4	2,331.43
Other Machinery	.00	.0	.00
Sub-Total	**24,457.14**		**2,445.71**

Table 13

Production Costs and Returns for Bedding Plant/ Ornamental Greenhouses, 2000

Production Area: 26,238.3 sq.ft.

Number of producers: 7

			Total $	$/sq. ft.
(A)				
	1. Crop Sales - Imputed Value of Production		206,889.19	7.89
	2. Crop Insurance Receipts		.00	.00
	3. Miscellaneous Receipts		.00	.00
	GROSS RETURN		**206,889.19**	**7.89**
(B)				
	1. Growing Media, Seed/Cuttings		24,731.01	.94
	2. Fertilizer & Chemicals		1,857.86	.07
	3. Greenhouse Insurance		1,745.34	.07
	4. Trays, Boxes & Other Packaging		10,020.71	.38
	5. Freight and /or Trucking Costs		1,240.71	.05
	6. Auto Fuel, Repairs, Licenses & Auto Ins.		5,083.50	.19
	7. Repairs - Buildings and Equipments		2,763.86	.11
	8. Utilities: Natural Gas	0.00 GJ	18,066.43	.69
	9. Electricity	0.00 KW	2,468.00	.09
	10. Water	0.00 M^3	350.00	.01
	11. Phone		1,030.64	.04
	12. Custom Work & Specialized Labour		.00	.00
	13. Marketing Costs		1,928.57	.07
	14. Assoc. Dues, Prof'l Fees & Promotion		4,938.29	.19
	15. Small Tools, Supplies & Misc. Expenses		2,390.71	.09
	16. Operating Interest Paid		2,742.86	.10
	17. Labour Insurance / Benefits		281.43	.01
	18. Hired Labour	4,134.81 hours	33,424.93	1.27
	19. Unpaid Labour	3,835.43 hours	40,207.57	1.53
	VARIABLE COSTS		**155,272.42**	**5.92**
(C)				
	1. Property / Business taxes		4,267.86	.16
	2. Equipment & Building	a) Depreciation	15,769.82	.60
		b) Lease Payments	1,028.57	.04
	3. Paid Capital Interest		2,165.00	.08
	TOTAL CAPITAL COSTS		**23,231.25**	**.89**
(D)	**CASH COSTS**	(B+C-B19-C2a)	**122,526.28**	**4.67**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)	**178,503.67**	**6.80**
(F)	**GROSS MARGIN**	(A-D)	**84,362.91**	**3.22**
	RETURN TO UNPAID LABOUR	(A-E+B19)	**68,593.09**	**2.61**
	RETURN TO INVESTMENT	(A-E+C2a) 13.6 %	**44,155.34**	**1.68**
	RETURN TO EQUITY	(A-E)	**28,385.51**	**1.08**

Greenhouse Production Costs and Returns for Bedding Plants/Ornamentals

Gross Return:

Gross return (A) represents sales of bedding plants/ornamentals during the 2000 crop production year. For a greenhouse with a production area of 26,283 square feet, gross return was calculated at $206,889 per average greenhouse or $7.89 per square foot.

Variable Costs:

Variable costs (B) represent all out-of-pocket costs including unpaid labour. These costs were estimated at $155,272 per average greenhouse of 26,238 square feet. In terms of dollars per square foot, average variable costs were $5.92 square foot. The most significant cost items were unpaid labour at $1.53 per square foot, followed by hired labour at $1.27 per square foot, growing media, seed/cuttings were estimated at $0.94 and natural gas costs at $0.69 per square foot. Details on all variable cost items are presented in Table 13.

Capital Costs:

Capital costs (C) include property/business taxes, equipment and building depreciation and actual interest paid on capital. These costs were estimated at $23,231 per average greenhouse or $0.89 per square foot.

Cash Costs:

Cash costs (D) represent all out-of-pocket costs incurred during the bedding plants/ornamentals production. These amounted to $122,526 per greenhouse with an average area of 26,238 square feet ($4.67 square foot).

Total Production Costs:

Average total production costs (E) for bedding plants/ornamentals producing greenhouses were calculated at $178,504. These were $6.80 per square foot based on greenhouse production area. Detailed breakdowns of various cost items are given in Table 13. Figure 5 shows the relative proportion of all production costs for greenhouse bedding plants/ornamentals.

Management Indicators:

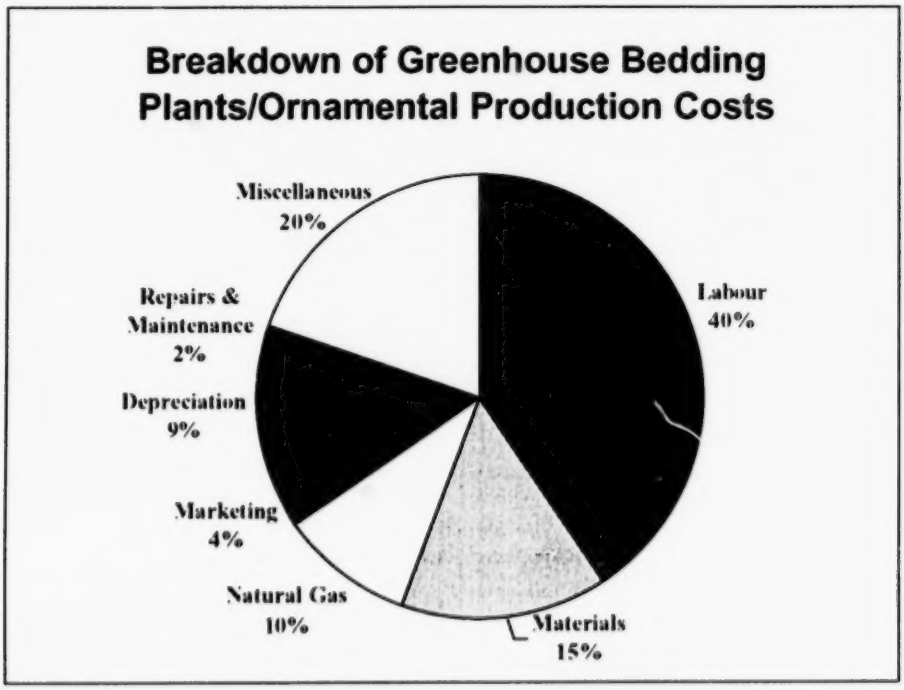
Gross margin (F) is equal to gross return (A) less cash costs (D). It was calculated at $84,363 for an average greenhouse producing bedding plants/ornamentals. In terms of per square foot, gross margin was $3.22. It was the highest gross margin recorded when compared with other greenhouse crops.

Average return to unpaid labour for these greenhouses was $68,593 ($2.61 per square foot) for bedding plants/ornamentals produced in 2000. Again return per square foot was the highest for these crops.

Average return to investment was estimated at 13.6 percent. In terms of total amount it was $44,155 per average greenhouse or $1.68 per square foot. Return to equity amounted to

$28,386 per greenhouse or $1.08 per square foot. Details on gross return, production costs and management indicators are presented in Table 13.

Figure 5



SECTION VIII

Greenhouse Production Costs and Returns for Cut Flowers

Greenhouse area in Alberta under cut flowers is relatively small compared to other major greenhouse crops. In the 2000 greenhouse industry survey, the area for cut flowers was estimated at 467,350 square feet or about four percent of the total greenhouse area in the province. Number of greenhouse operations producing cut flowers was 26 in 2000. Data on greenhouse investment, gross return and production costs was obtained from six greenhouse operations across the province. Average size of the greenhouse producing cut flowers was 26,075 square feet.

Investment for Greenhouses Producing Cut Flowers

Land area associated with an average greenhouse was about 4.5 acres. Land was valued at $13,625 or $0.52 per square foot. Building investment for cut flower greenhouses was estimated at $193,023 or $7.40 per square foot. Machinery and equipment represented almost 58 percent of the total investment, which amounted to $290,473 or $11.14 per square foot. Total value of investment for a 26,075 square foot greenhouse producing cut flowers was about $497,120 or $19.07 per square foot. Details on investments for cut flower greenhouses are given in Table 14.

Greenhouse Production Costs and Returns for Cut Flowers

Gross Return:

Gross return (A) from cut flowers was reported to be $296,241 per greenhouse or $12.66 per square foot. When miscellaneous receipts were added to gross return, it increased to $297,108 per average ($12.69 per square foot) greenhouse producing cut flowers. Gross return per square foot was the highest for cut flowers among all of the greenhouse crops analyzed for this report.

Variable Costs:

Variable costs (B) including unpaid labour amounted to $237,312 per average greenhouse (23,405 square feet) producing cut flowers. In terms of variable costs per square foot, these were $10.14, the highest among all of the greenhouse crops studied. Most significant cost items were growing media, seed/cuttings followed by hired labour and natural gas costs. The detailed breakdown of all variable cost items is presented in Table 15.

Capital Costs:

Capital costs (C) include cost items such as property/business taxes, equipment and building depreciation, lease payments and capital interest payment. These costs were estimated at $28,952 per average greenhouse producing cut flowers or $1.24 per square foot.

Table 14

Average Investment for Cut Flower Producing Greenhouses, 2000
Greenhouse Area: 26,074.5 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	13,625.00	.52
Buildings	193,022.50	7.40
Machinery & Equipment	290,472.83	11.14
TOTAL INVESTMENT	**497,120.33**	**19.07**

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	**13,625.00**		
Greenhouse Buildings:	**193,022.50**	**9.5**	**6,755.79**
Equipment:			
Refrigeration / Freezer Storage	13,333.33	4.3	666.67
Warehouses / Storage Sheds	32,833.33	10.5	1,641.67
Fuel Tanks	791.67	10.7	39.58
Houses(25%)	8,166.67	19.2	408.33
Other Buildings	.00	.0	.00
Lighting	75,146.83	3.3	3,757.34
Heating System	77,571.83	7.0	3,878.59
Ventilation System	4,316.67	2.4	215.83
Humidity Control	3,000.00	1.5	150.00
Benches	5,083.33	6.1	254.17
Irrigation System	6,533.33	5.2	653.33
Water Pumps / Sand Filters	9,733.33	6.4	973.33
Soil Mixers / Flat Fillers /Seedling Lines	450.00	2.0	45.00
Generators	9,583.33	8.8	958.33
Roto-Tillers	1,333.33	4.6	133.33
Storage / Mixing Tanks	4,917.50	7.2	491.75
Sterilizers	.00	.0	.00
Sprayers	1,528.33	6.5	152.83
Carts / Dolleys	583.33	6.0	58.33
Fertilizer Injectors	3,400.00	3.8	340.00
Small Tools / Hardware	10,266.67	5.3	1,026.67
Sub-Total	**268,572.83**		**15,845.10**
Machinery & Vehicles			
Bobcats / Forklifts	2,416.67	7.5	241.67
Trucks	19,483.33	6.3	1,948.33
Other Machinery	.00	.0	.00
Sub-Total	**21,900.00**		**2,190.00**

Table 15

Production Costs and Returns for Cut Flower Producing Greenhouses, 2000

Production Area: 23,407.8 sq.ft.

Number of producers: 6

			Total $	$/sq. ft.
(A)				
	1. Crop Sales - Imputed Value of Production		296,240.95	12.66
	2. Crop Insurance Receipts		.00	.00
	3. Miscellaneous Receipts		866.67	.04
	GROSS RETURN		**297,107.62**	**12.69**
(B)				
	1. Growing Media, Seed/Cuttings		64,660.17	2.76
	2. Fertilizer & Chemicals		4,570.00	.20
	3. Greenhouse Insurance		5,045.67	.22
	4. Trays, Boxes & Other Packaging		4,189.33	.18
	5. Freight and /or Trucking Costs		14,299.33	.61
	6. Auto Fuel, Repairs, Licenses & Auto Ins.		5,308.33	.23
	7. Repairs - Buildings and Equipments		6,314.50	.27
	8. Utilities: Natural Gas	0.00 GJ	25,281.67	1.08
	9. Electricity	0.00 KW	13,642.33	.58
	10. Water	0.00 M^3	88.33	.00
	11. Phone		1,743.17	.07
	12. Custom Work & Specialized Labour		502.00	.02
	13. Marketing Costs		616.67	.03
	14. Assoc. Dues, Profl Fees & Promotion		5,102.50	.22
	15. Small Tools, Supplies & Misc. Expenses		4,674.17	.20
	16. Operating Interest Paid		8,584.00	.37
	17. Labour Insurance / Benefits		2,870.00	.12
	18. Hired Labour	6,822.33 hours	58,137.00	2.48
	19. Unpaid Labour	1,067.00 hours	11,703.00	.50
	VARIABLE COSTS		**237,312.17**	**10.14**
(C)				
	1. Property / Business taxes		1,694.50	.07
	2. Equipment & Building	a) Depreciation	24,790.89	1.06
		b) Lease Payments	1,200.00	.05
	3. Paid Capital Interest		1,266.67	.05
	TOTAL CAPITAL COSTS		**28,952.05**	**1.24**
(D)	**CASH COSTS**	(B+C-B19-C2a)	**229,770.33**	**9.82**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)	**266,264.22**	**11.38**
(F)	**GROSS MARGIN**	(A-D)	**67,337.28**	**2.88**
	RETURN TO UNPAID LABOUR	(A-E+B19)	**42,546.40**	**1.82**
	RETURN TO INVESTMENT	(A-E+C2a) 11.2 %	**55,634.28**	**2.38**
	RETURN TO EQUITY	(A-E)	**30,843.40**	**1.32**

Cash Costs:

Cash Costs (D) for the purposes of this study do not include unpaid labour and depreciation for equipment and buildings. Cash costs for cut flower production were estimated at $229,770 per average greenhouse or $9.82 per square foot. Again, these were the highest costs among all of the greenhouse crops.

Total Production Costs:

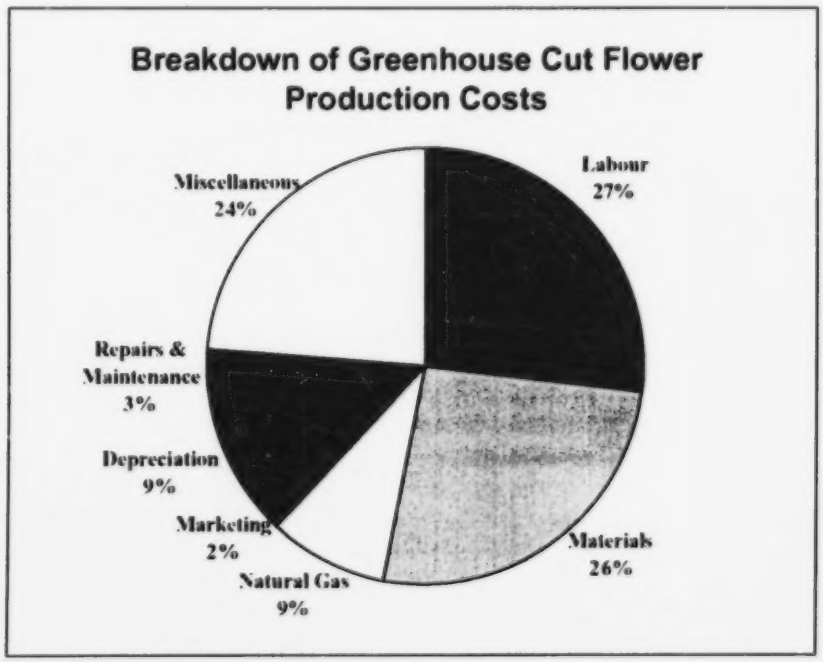
Total production costs (E), which includes all variable costs (B) and capital costs (C) were calculated to be $266,264 per average greenhouse producing cut flowers (23,408 square feet). These were $11.38 per square foot for cut flowers produced in the 2000-2001 crop year. Total production costs for cut flower production was the highest among all crops produced in greenhouses. Details on production costs are given in Table 15. Figure 6 presents the breakdown of production costs for greenhouse cut flower production.

Management Indicators:

Gross margin (F) for cut flowers production was $67,337 per greenhouse or $2.88 per square foot. It was the second highest after a gross margin of $3.22 per square foot for bedding plants/ornamentals.

Average return to unpaid labour was estimated at $42,546 per greenhouse or $1.82 per square foot. Return to investment for cut flower production was calculated at 11.2 percent. It was $55,634 per greenhouse and $2.38 per square foot. Return to equity was also positive at $30,843 per greenhouse ($1.32 per square foot). The details on management indicators are presented in Table 15.

Figure 6



SECTION IX

Greenhouse Production Costs and Returns For Tree Seedlings

Greenhouse tree seedling production in Alberta received a big boost in the late eighties when a decision was made to encourage local production of seedlings. Prior to this, forestry tree seedlings were largely imported from British Columbia. As soon as the contracts to grow seedlings locally became available, several existing greenhouses switched to producing seedlings. At the same time quite a few new greenhouses were also built to meet the contractual demand. Presently, tree seedlings are the third largest greenhouse crop after bedding plants and cucumbers. Tree seedlings are produced in about 2.3 million square feet (52.4 acres) of greenhouse area in the province. The greenhouse area under tree seedlings is expected to increase modestly over the next several years. Survey of the greenhouse industry in 2000 revealed that there were 27 greenhouse operations engaged in tree seedling production. Average area per tree seedling producing greenhouse was estimated at 84,547 square feet in 2000.

Data on greenhouse tree seedlings investment, production costs and returns was obtained from seven greenhouse operations across the province. Average greenhouse operations were significantly higher than the industry average mentioned above. It was worth noting that greenhouse tree seedlings are produced under contract by forestry companies and provincial government.

Investment for Tree Seedling Greenhouses

The average greenhouse area for the seven tree seedling operations was estimated at 118,820 square feet, which was significantly higher than the industry average of 84,547 square feet. Land area associated with these greenhouses average around 13.6 acres at a cost of $40,886 per greenhouse.

Investment in the greenhouse buildings for tree seedling operations was calculated at $574,393 per operation or $4.83 per square foot. Average investment in machinery and equipment including vehicles amounted to $1.2 million per greenhouse ($10.22 per square foot) with an average size of 118,820 square feet. When land, buildings, machinery and equipment investments were combined, total investment was estimated at $1.8 million per operation. In terms of dollars per square foot it was $15.40. Details on the land, buildings, machinery and equipment investment and depreciation amounts are presented in Table 16.

Greenhouse Production Costs and Returns for Tree Seedlings

Gross Return:

Gross return (A) represents sales of tree seedlings to the contractors at the agreed price and any income received under crop insurance, etc. Total gross return for an average greenhouse (111,860 square feet) producing tree seedlings was estimated at $853,043 or $7.63 per square foot. In addition to sales of tree seedlings, there was some income reported under crop insurance receipts. When these receipts were combined with sales of tree seedlings, the total gross return amounted to $864,718 per average greenhouse or $7.73 per square foot. For details, please see Table 17.

Table 16

Average Investment for Tree Seedling Producing Greenhouses, 2000
Greenhouse Area: 118,819.9 sq.ft.

INVESTMENT SUMMARY:	Total $	$/sq. ft.
Land	40,885.71	.34
Buildings	574,392.86	4.83
Machinery & Equipment	1,214,613.50	10.22
TOTAL INVESTMENT	**1,829,892.07**	**15.40**

INVESTMENT DETAIL:	Enterprise Value ($)	Age (Years)	Depreciation ($)
Land -Building Site:	**40,885.71**		
Greenhouse Buildings:	**574,392.86**	**7.8**	**20,103.75**
Equipment:			
Refrigeration / Freezer Storage	55,714.29	3.7	2,785.71
Warehouses / Storage Sheds	261,785.71	10.9	13,089.29
Fuel Tanks	3,215.71	5.6	160.79
Houses(25%)	9,562.50	12.2	478.13
Other Buildings	642.86	.4	32.14
Lighting	64,015.71	3.1	3,200.79
Heating System	201,357.14	5.9	10,067.86
Ventilation System	88,050.00	6.3	4,402.50
Humidity Control	37,714.29	2.9	1,885.71
Benches	126,921.43	4.8	6,346.07
Irrigation System	82,600.00	5.9	8,260.00
Water Pumps / Sand Filters	6,457.14	6.3	645.71
Soil Mixers / Flat Fillers /Seedling Lines	66,857.14	4.7	6,685.71
Generators	18,892.86	8.1	1,889.29
Roto-Tillers	1,583.29	2.9	158.33
Storage / Mixing Tanks	12,015.71	6.4	1,201.57
Sterilizers	5,000.00	1.4	500.00
Sprayers	1,569.29	2.6	156.93
Carts / Dolleys	3,275.71	3.9	327.57
Fertilizer Injectors	9,871.43	5.7	987.14
Small Tools / Hardware	46,360.71	4.2	4,636.07
Sub-Total	**1,103,462.93**		**67,897.31**
Machinery & Vehicles			
Bobcats / Forklifts	49,571.43	7.4	4,957.14
Trucks	53,079.14	4.1	5,307.91
Other Machinery	8,500.00	.0	850.00
Sub-Total	**111,150.57**		**11,115.06**

Table 17

Production Costs and Returns for Tree Seedling Producing Greenhouses, 2000

Production Area: 111,860.0 sq.ft.

Number of producers: 7

				Total $	$/sq. ft.
(A)					
	1. Crop Sales - Imputed Value of Production			853,043.29	7.63
	2. Crop Insurance Receipts			11,571.43	.10
	3. Miscellaneous Receipts			102.86	.00
	GROSS RETURN			**864,717.57**	**7.73**
(B)					
	1. Growing Media, Seed/Cuttings			17,785.71	.16
	2. Fertilizer & Chemicals			13,522.00	.12
	3. Greenhouse Insurance			17,746.43	.16
	4. Trays, Boxes & Other Packaging			75,857.14	.68
	5. Freight and /or Trucking Costs			5,939.29	.05
	6. Auto Fuel, Repairs, Licenses & Auto Ins.			19,680.57	.18
	7. Repairs - Buildings and Equipments			30,071.43	.27
	8. Utilities: Natural Gas	0.00 GJ		91,914.14	.82
	9. Electricity	0.00 KW		28,595.71	.26
	10. Water	0.00 M^3		3,225.71	.03
	11. Phone			3,932.29	.04
	12. Custom Work & Specialized Labour			2,520.14	.02
	13. Marketing Costs			29,919.71	.27
	14. Assoc. Dues, Prof'l Fees & Promotion			14,732.29	.13
	15. Small Tools, Supplies & Misc. Expenses			4,933.57	.04
	16. Operating Interest Paid			14,875.71	.13
	17. Labour Insurance / Benefits			12,749.71	.11
	18. Hired Labour	36,469.29 hours		344,714.29	3.08
	19. Unpaid Labour	1,270.61 hours		12,939.61	.12
	VARIABLE COSTS			**745,655.47**	**6.67**
(C)					
	1. Property / Business taxes			1,705.86	.02
	2. Equipment & Building	a) Depreciation		99,116.12	.89
		b) Lease Payments		711.43	.01
	3. Paid Capital Interest			9,834.29	.09
	TOTAL CAPITAL COSTS			**111,367.69**	**1.00**
(D)	**CASH COSTS**	(B+C-B19-C2a)		**744,967.43**	**6.66**
(E)	**TOTAL PRODUCTION COSTS**	(B+C)		**857,023.16**	**7.66**
(F)	**GROSS MARGIN**	(A-D)		**119,750.14**	**1.07**
	RETURN TO UNPAID LABOUR	(A-E+B19)		**20,634.03**	**.18**
	RETURN TO INVESTMENT	(A-E+C2a)	5.8 %	**106,810.53**	**.95**
	RETURN TO EQUITY	(A-E)		**7,694.41**	**.07**

Variable Costs:

Variable costs (B), which include unpaid labour amounted to $745,655 per greenhouse during the 2000-2001 tree seedlings production year. In terms of per square foot, these costs were estimated at $6.67. The most significant cost item was the hired labour at $3.08 per square foot, almost 46 percent of all variable costs. Other significant costs were natural gas, followed by trays, boxes and other packaging, repairs to buildings and equipment and electricity. A detailed breakdown of all variable costs is presented in Table 17.

Capital Costs:

Capital costs (C) include property/business taxes, equipment and building depreciation, lease payments and paid capital interest. These costs were estimated at $111,368 per average greenhouse producing tree seedlings or $1 per square foot. Almost 90 percent of the capital costs were equipment and building depreciation.

Cash Costs:

Cash costs (D) consist of all out-of-pocket costs incurred during the tree seedlings production period. Cash costs were estimated at $744,967 per greenhouse or $6.66 per square foot. These costs were marginally lower than the variable costs.

Total Production Costs:

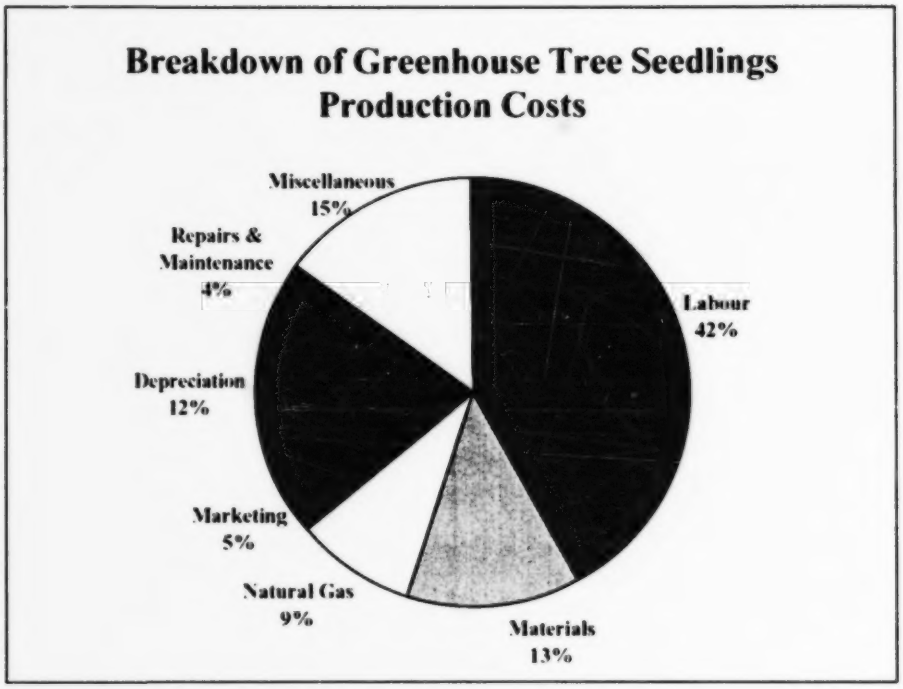
Average total production costs for tree seedling greenhouses were estimated at $857,023 or $7.66 per square foot of greenhouse production area during the 2000-2001 crop year. As mentioned above, the most significant cost items were hired labour, depreciation, natural gas and trays, boxes and other packaging. Details on various costs are presented in Table 17. Figure 7 presents the breakdown of all production costs for greenhouse tree seedling production.

Management Indicators:

Management indicators present data on gross margin (F), return to unpaid labour, return to investment and return to equity. Gross margin is based on gross return (A), less cash costs (D). For an average tree seedling producing greenhouse, gross margin was calculated at $119,750 or $1.07 per square foot. A positive gross margin shows that enterprise is profitable.

Average return to unpaid labour was positive at $20,634 per greenhouse producing tree seedlings. It was $0.18 per square foot. Return to investment was calculated at $106,811 per average greenhouse or $0.95 per square foot. In terms of percentage return to investment it was calculated at 5.8%. Return to equity, another management indicator was also marginally positive at $7,694 per greenhouse or $0.07 per square feet. Details on management indicators are presented in Table 17.

Figure 7


Breakdown of Greenhouse Tree Seedlings Production Costs
Miscellaneous 15%
Repairs & Maintenance 4%
Labour 42%
Depreciation 12%
Marketing 5%
Natural Gas 9%
Materials 13%

SECTION X

SUMMARY

Summary of Costs and Returns

This section provides a summary of the 2000 – 2001 costs and returns data for the various greenhouse crops produces across the province. Data on the major greenhouse crops was obtained from forty-two greenhouse operations scattered throughout Alberta. Distribution of the study sample by crops was as follows:

Greenhouse Crop	Number of Participants
Cucumber	10
Tomatoes	7
Peppers	5
Bedding Plants/Ornamentals	7
Cut Flower	6
Tree Seedlings	7
Total	**42**

Investment and investment costs were computed from the data provided by study participants by crops. Total investment per greenhouse and cost per square foot are presented in Table by various crops. Average investment cost per square foot ranged from $10.47 for bedding plants/ornamentals to $19.07 for cut flowers producing greenhouses.

Gross return per square foot was the highest for cut flower production at $12.69. Gross return for cucumbers was at $6.01 per square foot, $7.70 per square foot for tomatoes, $8.65 per square foot for peppers, $7.89 per square foot for bedding plants/ornamentals and $7.73 per square foot for tree seedling producing greenhouses.

Average production costs for the 2000 – 2001 crop year, summarized by types of crops produced in greenhouses in Alberta, are presented in Table18. Major production costs varied by type of crops produced in the greenhouses. However, these can be categorized as labour (hired and operator), material inputs, marketing costs and natural gas. Total production costs ranged from a low of $6.41 per square foot for cucumbers to a high of $11.38 per square foot for cut flower greenhouses.

Greenhouses producing bedding plants/ornamental showed the highest gross margin per square foot at $3.22 followed by cut flowers at $2.88, peppers at $2.84, tree seedlings at $1.07, tomatoes at $0175 and cucumbers to $2.38 per square foot for cut flowers. Average return to equity was negative at $0.41 and $0.31 per square foot for cucumbers and tomatoes, respectively. Return to equity for other greenhouse crops (peppers, bedding plants/ornamentals, cut flowers and tree seedlings) were positive. Details on costs and returns are presented in Table 18.

TABLE 18

SUMMARY OF GREENHOUSE PRODUCTION COSTS AND RETURNS BY CROPS, 2000

	Cucumbers	Tomatoes	Peppers	Bedding Plants/ Ornamentals	Cut Flowers	Tree Seedlings
Number Survey	10	7	5	7	6	7
Average Production (Area (sq.ft.)	53,351	35,204	36,965	26,283	23,409	111,860
----------dollars per square foot----------						
Average Investment	12.56	14.15	14.56	10.47	19.07	15.4
Gross Revenue	6.01	7.70	8.65	7.89	12.69	7.73
Material Inputs	0.85	1.10	1.16	1.39	2.94	0.96
Natural Gas	0.97	1.60	1.09	0.69	1.08	0.82
Hired Labour	0.81	1.32	0.92	1.27	2.48	3.08
Marketing Costs	0.99	1.07	1.08	0.26	0.25	0.40
Other Cash Costs	1.07	1.15	0.93	0.77	2.89	1.28
Operator Labour	0.46	0.34	0.62	1.53	0.50	0.12
Capital Costs	1.26	1.43	1.45	0.89	1.24	1.00
Total Production Costs	**6.41**	**8.01**	**7.25**	**6.80**	**11.38**	**7.66**
Gross Margin	0.68	0.75	2.84	3.22	2.88	1.07
Return to Investment	0.22	0.41	2.22	1.68	2.38	0.95
Return to Equity	(0.41)	(0.31)	1.41	1.08	1.32	0.07